Community-Acquired Pneumonia:
Multiyear Trends in Hospital Outcomes, California, 1999-2004

Office of Statewide Health Planning and Development
Healthcare Information Division
February, 2007

Background

The Office of Statewide Health Planning and Development (OSHPD) has published two reports on hospital quality of care for patients with community-acquired pneumonia. These reports are available at http://www.oshpd.ca.gov . The first one reported quality ratings based on risk-adjusted death rates for patients that received care during the three-year period 1999-2001. The second reported the results for patients receiving care during 2002-2004.

This report shows the single-year death rates for each of these years, 1999 – 2004. In the graphs shown here the death rates are risk-adjusted using the same methodology reported in the full reports, but without tests of statistical significance.

Looking at the CAP results in this way is important because multi-year results shed the clearest light on the pattern of performance for any given hospital over time. Some hospitals will have made efforts to improve care since the years shown here. If a hospital's performance is poor, the patient should inquire about what the hospital has done to improve its performance in recent years.

Overall, pneumonia is the sixth leading cause of death. Among diseases caused by infection it is the number one cause of death. It is estimated that there are 2-4 million cases annually in the United States. In California, one out of eight patients admitted to the hospital with pneumonia dies within 30 days.

Community-acquired pneumonia (CAP) is pneumonia that is acquired outside an institutional setting, for example, at home or at work. In contrast, hospital-acquired pneumonia is acquired by patients while hospitalized for a different reason.

For pneumonia patients who are admitted to the hospital, timely diagnosis and treatment are critical for improving outcomes and chances of survival. As reported in the full CAP Outcomes report for 2002-2004, the percentage of patients that die within 30 days of hospital admission ranges from 8% in hospitals rated as "better" to over 17% in hospitals rated as "worse". Such a large difference in outcomes, even after accounting for the severity of risk in patient mix, suggests that there are important differences in the clinical practices of better and worse hospitals.

Measuring quality of care for CAP Patients

Comparing each hospital's risk-adjusted mortality rate for CAP patients with the statewide rate assesses the quality of hospital performance in caring for CAP patients. Risk adjustment is a statistical method for adjusting the mortality rate to give hospitals "credit" if they are caring for sicker patients. This allows for a fair comparison of each hospital's mortality rate with the statewide rate and with the rates of other hospitals. Hospitals are defined as "better" if their risk-adjusted mortality rates are significantly lower than the state rate and "worse" if they are higher.

A full explanation of the risk-adjustment methodology is available in the Technical Appendix (Appendix A) of *Community-Acquired Pneumonia, Hospital Outcomes in California, 2002-2004*, at www.oshpd.ca.gov.

Two statistical models are used for doing the risk adjustment. The first model includes risk factors such as age, gender, and specific health conditions present among patients before they were admitted for care. In the second model, the presence of a Do Not Resuscitate (DNR) order was added to the set of adjustment risk factors. Having a DNR order within 24 hours of admission was included as a risk factor because it indicates the presence of underlying severe illness and because it predicts 30-day mortality. For a full description of how the methodology was developed, see "Report for the California Hospital Outcomes Program, Community-Acquired Pneumonia, 1996: Model Development and Validation" at the following web site: www.oshpd.ca.gov/HQAD/Outcomes/Studies/CAP/index.htm, click on Model Development and Validation.

The effect of risk adjustment on a hospital's mortality rate depends on the severity of illness in its patients. If the patients are sicker than the statewide average then risk adjustment will shift the hospital's mortality rate downward to a lower (better) rate. On the other hand, if a hospital's patients are comparatively less sick at the time they are admitted, the adjustment will shift the mortality rate upward, "penalizing" them for treating a patient group that is not as severely ill.

Data sources and selection of hospitals and patients

The primary data source for these analyses is the Patient Discharge Data (PDD) collected by OSHPD. To identify deaths that occur after patient discharge from the hospital, the PDD records are matched to the death certificate files maintained by the California Department of Health Services.

All acute care hospitals reporting patient discharge information to OSHPD are eligible for inclusion. However, quality ratings are shown only for hospitals that care for at least 30 CAP patients during those three years. Patients are included in the analysis if they are adults (age 18 years or older) and if they are admitted to the hospital with a diagnosis of community-acquired pneumonia. See the Technical Appendix of the full report for a complete explanation selection and exclusion criteria.

Results: Hospital quality ratings over time

Using the methods and data described above, the risk-adjusted mortality rate for each hospital (with DNR and without DNR in the model) has been calculated for each of the years covered by the full reports, 1999-2001 and 2002-2004. In this report, the single-year risk-adjusted death rates are shown in a trend line graph for each hospital, compared with the statewide (average) CAP mortality rate for the same years.

Multi-year trend lines show the pattern of mortality outcomes for hospitals over time. For many hospitals there is no consistent trend upward or downward and most are similar to the statewide rate. However, some hospitals show a consistent downward trend in mortality rates over time, indicating improvement in the quality of their care for CAP patients, while others show consistently high rates, indicating that the quality of care has not improved.

Reading the trend line graphs

The overall statewide rate is shown in light blue. The hospital's risk-adjusted death rates with and without DNR are shown in darker blue and grey, respectively. A missing data point on the graph indicates that the hospital had fewer than 30 CAP patients in a given year or that there was a change in the hospital license (the hospital closed or changed ownership) during that time. A death rate of zero indicates that all of the CAP patients treated at that hospital during the year survived. Hospitals with smaller numbers of cases are more likely to show extremely high or low rates and/or to have trend lines that vary up and down by large amounts over time.

The previous two CAP reports present risk-adjusted mortality rates that are averaged over the three-year study period. This report illustrates risk-adjusted mortality rates for each of the six years of data. This method is useful for evaluating trends. However, caution should be used when interpreting trends due to the effects of a small number of cases in some years.

Acknowledgments

The introductory text was prepared by Mary Tran, PhD, MPH. The multiyear dataset was prepared by Mallika Rajapaksa, PhD and Niya Fong and the graphs were prepared by Brian Paciotti, PhD.

Suggested Citation: *Community-Acquired Pneumonia: Multi-year Trends in Hospital Outcomes, California, 1999 – 2004.* Sacramento, California: Healthcare Information Division, California Office of Statewide Health Planning and Development, February 2007.